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PROTHROMBIN TIME, ACTIVATED PARTIAL THROMBOPLASTIN TIME AND PLATELET COUNT IN PATIENTS WITH DIABETES MELLITUS

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Abstract

Diabetes mellitus is a common disease in Libya, aimed to evaluate of Prothrombin Time, Activated Partial Thromboplastin Time and Thrombocytes among diabetic Patients and control . -This study includes 21 patients have diabetic and 49 persons as control. The blood coagulation markers, PT and aPTT were measured .

Data analysis was performed using statistical package for social science (SPSS, version,22). Evaluation of patient's data was performed using the t-test and Pearson correlation test. Results with p value >0.05 were considered as statistically insignificant. The results showed the mean of PT in diabetes was 15.190 in patients when was 15.428 in control, when the mean of APTT was 29.76 in diabetic patients, when was 28.69 in control.

The mean Platelet count cell ×(× 109 /L) , 269.90 in diabetic patients and in control was 294.35 . From the present study it may concluded that diabetes mellitus had no effects on PT and APTT. Routine examinations of PT, INR, APTT and Thrombocyte count are important to assess coagulation impairment among diabetic patients to prevent any thromboembolic complication.

Keywords: Prothrombin Time, Thromboplastin Time, Diabetes Mellitus.

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Introduction

Diabetes mellitus (DM) is characterized by hyperglycemia accompanied with the biochemical alterations in carbohydrate, protein and lipid metabolism. Diabetics have been shown to be in procoagulant state due to abnormalities in several plasma proteins in blood coagulation. Measurement of prothrombin time (PT), activated partial thromboplastin time (APTT), bleeding time and clotting factor concentration are usually done in patients with a suspected abnormal coagulation. The present study was planned to assess and compare the coagulation tests inpatients healthy individuals. Diabetes mellitus (DM) is characterized by hyperglycemiaaccompanied with the biochemical alterations in carbohydrate, protein and lipid metabolism.1Type 2 DM accounts for about 80% of DM2 In patients with DM, cardiovascular disease (CVD)remains the main cause of morbidity and mortality and approximately 80% of patients die as a result of cardiovascularcomplications. Apart from the accelerated development of atherosclerosis in patients withdiabetes, these patients are also at an increased riskof thrombotic events. These individual have been shown to be in procoagulant state. Patients with diabetes mellitus have a high risk of atherothrombotic events. Diabetes contributes forinitiation and progression of microvascular and macrovascular complications. Shortened activated partial thromboplastintime (aPTT) values may reflect hypercoaguable state, which is associated with increased thrombotic risk and adverse cardiovascular events. Increased level offibrinogen

is common in type II . diabetes mellitus is a heterogeneous disorder that affects cellular metabolism in variety of ways, and coagulation indices are reported to be adversely affected. In the current study prothrombin time (PT) and activated partial thromboplastin time (APTT) were investigated in treated and untreated diabetics as well as in non diabetic controls. The incidence of cardiovascular disease due to thrombosis is 2–4 folds greater in diabetic patients. Prothrombin time, activated partial thromboplastin time and platelet count are hematological indices that give

an insight into the coagulation status. Hence, this study aims to assess the coagulation status oftype I and type II diabetic patients.

Aim of the study:

- Frequent assessment of prothrombin time and activated partial thromboplastin time are essential to determine procoagulant pathways ,coagulopathies and monitoring of anticoagulantdrug therapy .

- Hence this study focused on blood platelets, Prothrombin time and activated partialthromboplastin time among diabetes Patients**.**

2- Literature review

In 2017, the International Diabetes Federation estimated that 451 million adults are diagnosed with diabetes mellitus (DM) worldwide, and the number would increase to 693 million by 2045 [1]. Anesthesiologists are increasingly facing high-risk patients with significant comorbidities undergoing major surgery, including a significant risk for excessive bleeding, and hyperglycemia is associated with higher risk of perioperative complications and poorer outcomes after surgery [2,]. The hemostatic function of platelets and coagulation factors sometimes makes it difficult to control the pro-thrombotic state since global inhibition of coagulation will impair hemostasis [3].

The incidence of cardiovascular disease due to thrombosis Is 2–4 folds greater in diabetic patients. Prothrombin time, activated partial thromboplastin time and platelet count are hematological indices that give an insight into the coagulation status. Hence, this study aims to assess the coagulation status of type I and type II diabetic patients. [1-4] Diabetes

mellitus (DM) is metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Etiologically, diabetes is classified into two; type I and type II diabetes mellitus. Type II diabetes mellitus, previously called non-insulin dependent diabetes mellitus, is characterized by decreased insulin sensitivity which can subsequently provoke decreased insulin secretion as a result of Beta-cell loss. [5] Diabetes mellitus is a heterogeneous disorder that

affects cellular metabolism in variety of ways, and coagulation indices are reported to be adversely affected.

In the current study prothrombin time (PT) and activated partial thromboplastin time (APTT) were investigated in treated and untreated diabetics as well as in non-

diabetic controls.[6] The measurement of PT, APTT, are the most commonly employed laboratory tests in patients with a suspected coagulopathy [6].

Diabetic patients are not routinely screened for assessing their thrombotic status. As a consequence, they usually approach clinician when they manifest with the complications after the organs are exposed to the brunt of the disease. In spite of the vigorous management, recovery of the damaged organs to normal is questionable [7]. Diabetes augments the capability of coagulation. Increased level of plasminogen activator inhibitor-1 leads to impaired fibrinolysis inType 2 diabetes. Increased expression of tissue factor and coagulation factors along with decrease in endogenous anticoagulants such as protein C, antithrombin 3 is seen in diabetes. Thus, there is an increased tendency for coagulation combined with impaired fibrinolysis in patients with Type 2 diabetes [3-7].

Body of evidence suggest that certain haematological indices are altered in patients with diabetes mellitus[7]. In patient with diabetes mellitus, persistent hyperglycaemia exposes red blood cells (RBCs) to elevated glucose concentration, thus resulting in glycalation of haemoglobin, prothrombin, fibrinogen and other proteins involved in clotting mechanisms [8]. The glycation results in the incomplete activation and function of the clotting cascade [8].

Glycation of intrinsic and extrinsic clotting proteins will decrease the availability of theseproteins which affect the clotting capacity [9].

Changes in these proteins favour the development of hyper-coagulable and pro-thrombotic state, which may in turn enhance cardiovascular risk by increasing the likely hood of developing an occlusive thrombus within a coronary/cerebral artery contributing to the development of atherosclerotic lesion [10].

PT and APTT can therefore be used to assess the risk of clotting complications in patients with diabetes mellitus although modern coagulation diagnostic test are becoming more sophisticated, PT and APTT are still important basic examinations in clinical laboratories [5-11].

Diabetic patients are at high risk for the development of thrombosis and bleeding disorders. Approximately 80% of patients die as a result of cardiovascular complications and its incidencedue to thrombosis is 2–4 folds greater than the general population [12] .

However, there was no previous study that had been conducted concerning on evaluating the coagulation status of diabetes patients in the study area. Therefore, this study was aimed to assess the prothrombin time, activated partial thromboplastin time and platelet counts of diabetesmellitus .[13].

3-Material and method

This study was conducted in Benjawed ,in the period between march and July 2021On 70 patients among The studied of total diabetic patients were 49 and 21as control groups. with different age and sex. The exclusion criteria Patients with disorder in which the proteins that control blood clotting become over active (disseminated intravascular coagulation), Patients with liver disease and Patients with Warfarin (Coumadin) use.

Blood samples were collected from the individuals chosen for the study and analyzed for coagulation profile including Bleeding Time,Platelet

Count, Prothrombin Time (PT), activated Partial Thromboplastin Time (aPTT),. Statistical analysis was done by t-test using SPSS 21.0.

4- Results:

The studied of total diabetic patients were 21 and 49 as control groups. They have been categorized into different gender . They have been categorized into different ages whose frequencies are (20 -70years) .

The present study revealed that , p value was 0.037 (< 0.05). There was significant difference between the gender wise distribution of cases and controls. Table (1).

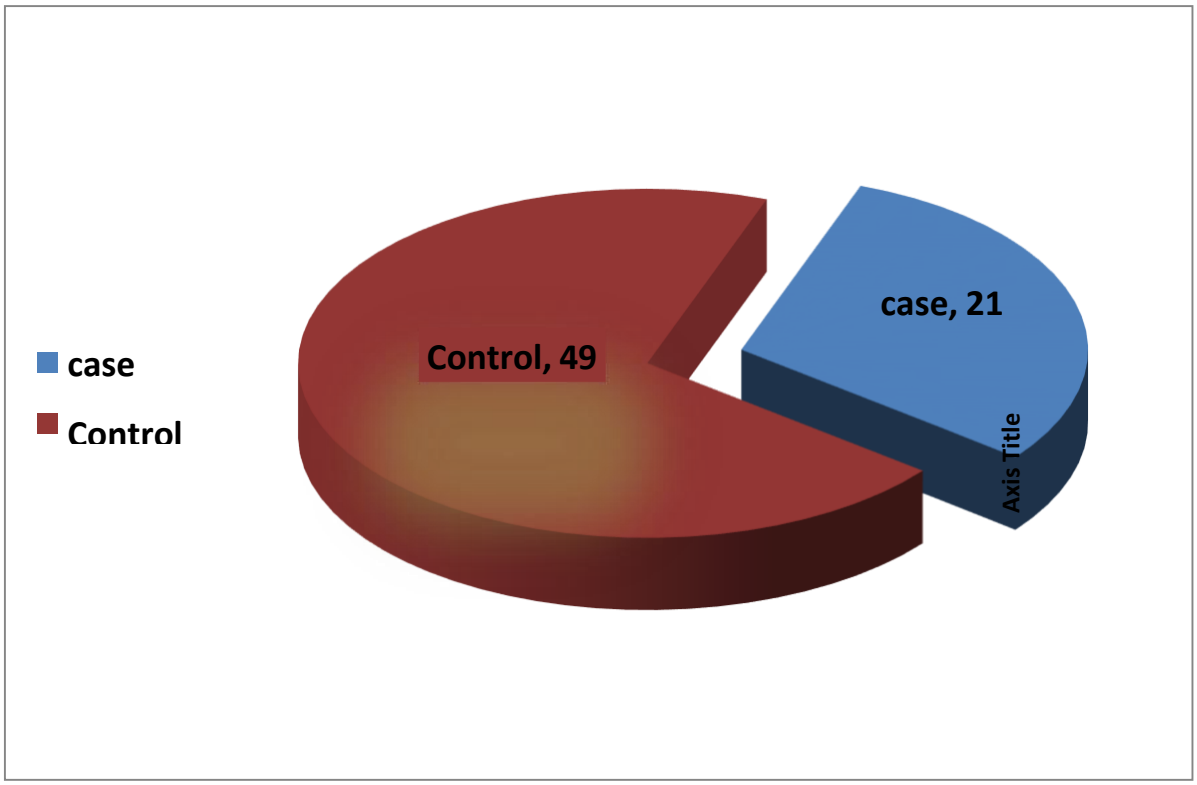
The results of PT in patient in mean was (15 seconds) and the mean of PT result incontrol was (15.4seconds), with P.value (0.770).

The results of APTT in patients in mean was (30 second) and the mean of APTT results in control were (28.6 seconds) with P.value (0.181). Table 2.

The studied of total diabetic patients were 21 and 49 as control groups. They have been categorized into different ages whose frequencies are (20 – 70 years) , p valuewas0.337 (p value> 0.05 There was no significant difference between the age of cases and controls . Table (3) .

Table (1) Participant characteristic according to Gender.

Gender	No. tested	Control	diabetic patients
Male	**24**	**(13) 54 %**	**(11) 45%**
Female	**46**	**(36)78 %**	**(10)**21.7%
Total	**70**	**49**	**21**
x^2 = 4.360, df =1 ,P-Value < 0.05, p=.037. (sig)			



Figure(1) Show the frequency of study group

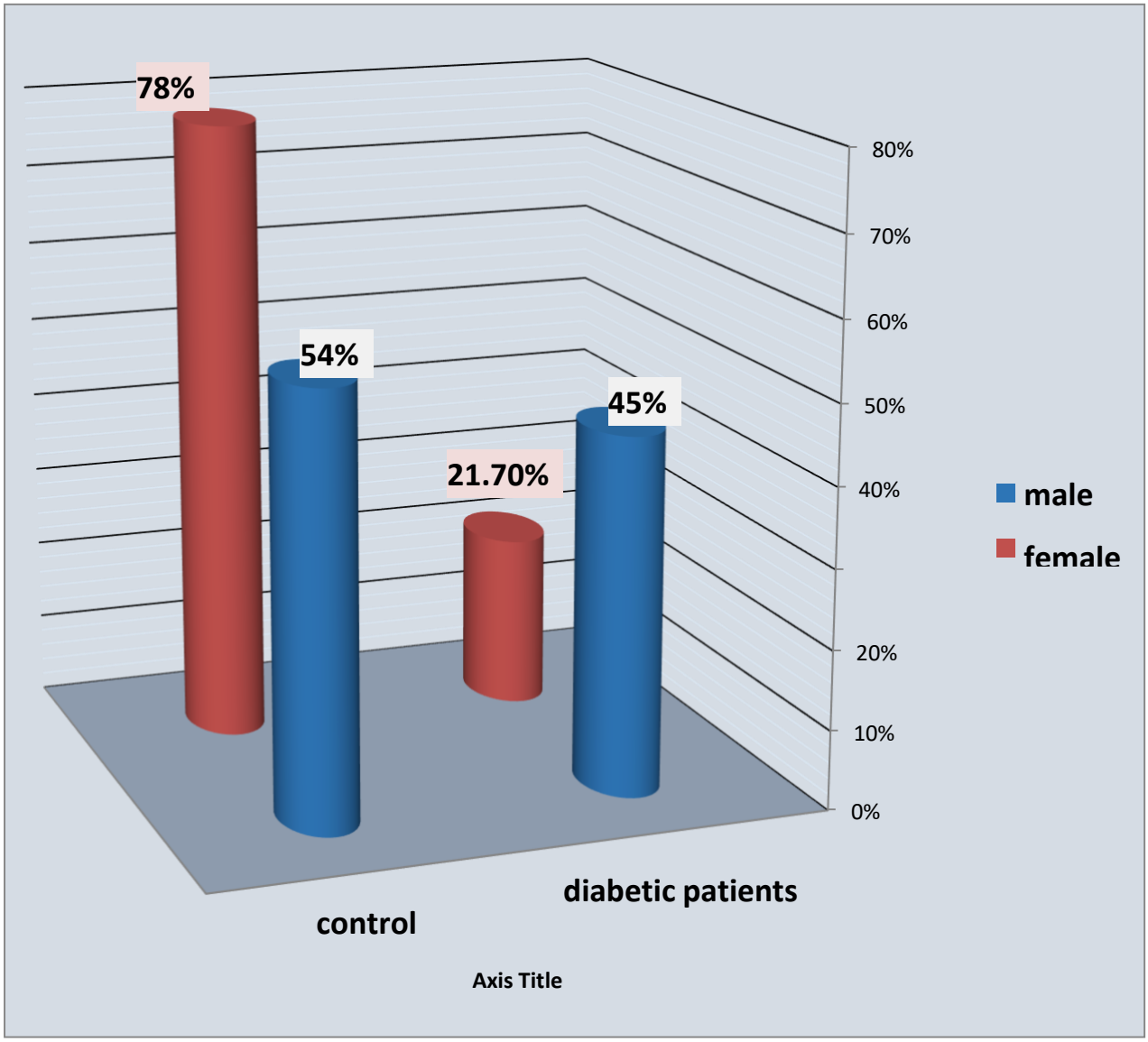


Figure (2): Participant characteristic according to Gender.

Table(2) Comparison of PT, PTT and Platelets between case & control .

parameters	Sample	N	Mean	Std. Deviation	t- value	P value	Sig
Prothrombin time/ sec	case	21	15.1905± 2.61952	2.61952	.322		NS
	control	49	15.4286± .47020	3.29140	.294	.770	
Activated partial thromboplastin time/sec	case	21	29.76 ± .628	2.879	1.361	0.181	NS
	control	49	28.69± .470	3.293	1.289		
Platelet count cell ×(× 10^9 /L)	case	21	269.90± 16.054	73.568	1.226	.227	NS
	control	49	294.35± 11.818	82.728	1.169		

Table (3) Distribution of the participants according to age groups (years)

Age groups	No. tested	Control	diabetic patients
10-20	3	2	1
21-30	19	13	6
31-40	17	15	2
41-50	11	6	5
51-70	20	13	7
Total	**70**	**49**	**21**
x^2 = 4.219, df =4 ,P-Value > 0.05, p= .377 (Non-sig)			

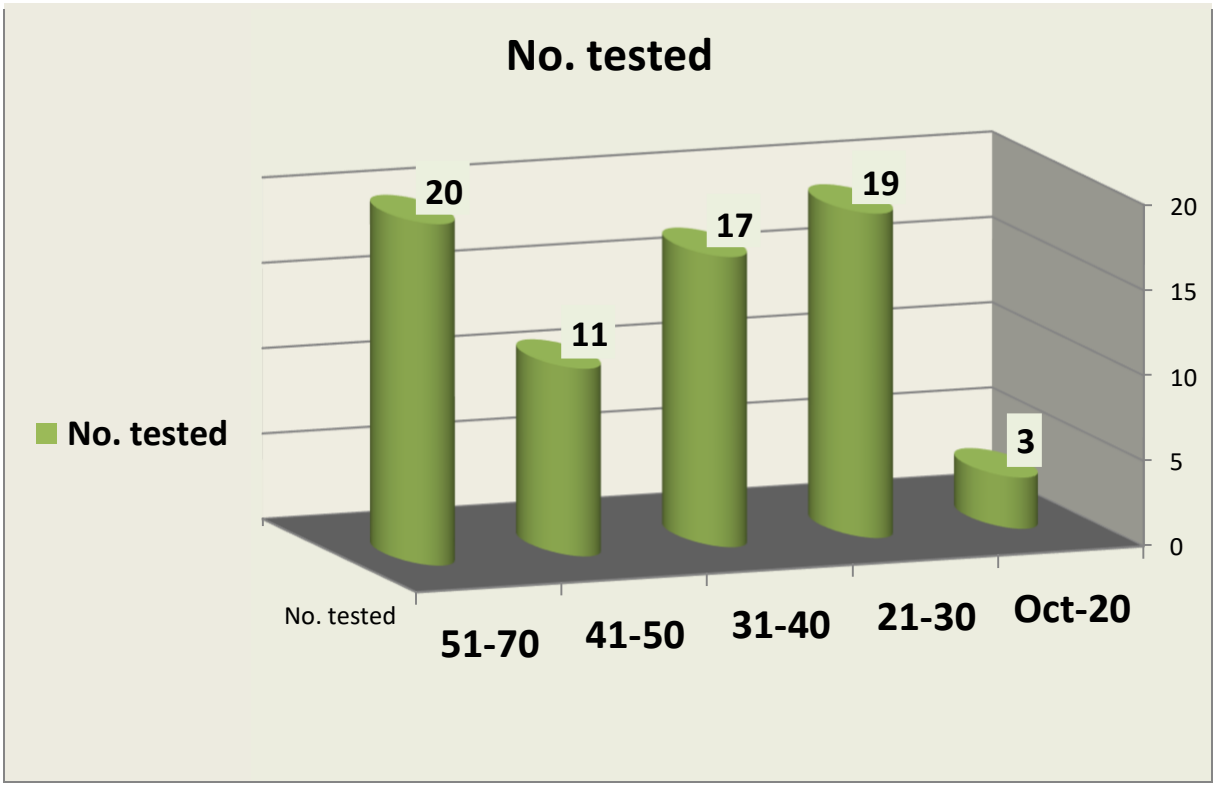


Figure (3) Distribution of the participants according to age groups (years).

5- Discussion

The current study was conducted to estimate coagulation tests among Diabetic patients and normal healthy individuals. Diabetes is characterized by heavy risk of atherothrombotic complications affecting the cerebral, coronary and peripheral arterial trees. PT is an indicator of defects extrinsic and common pathway while APTT indicates in intrinsic and common pathway. This may account for abnormalities in hemostasis**.**

Our study shows that significantly increased values APTT and PT among diabetic patient. Similar findings were observed in Omer ,2020.[10]. Prolonging of time period of coagulation tests and involvement of intrinsic coagulation pathway has also been confirmed by Soltani et al,[16]. But also, some studies found no significant changes in coagulation studies among diabetic patients [11,12,13].

Whereas few studies found lower of coagulation tests in diabetic patients [14,8].Again, in the present study, we found the platelets no significant changes when was compare to our case control . But inconsistent with the findings of a studies conducted by Omer, I. A.2020.[10,19].

Also in this study diabetic patients patients was insignificant with different ages, PT had insignificant variation with in diabetic patients. These finding strongly agreed with many studies similar to this study.[3,19].

Conclusion (S)

From the present study it may concluded that diabetes mellitus had no effects on PT and APTT. Our study showed increased platelet agreeability and decreased PT, APTT in diabetic patients are more prone to diseases . Therefore, monitoring the aPTT in newly diagnosed diabetic patients is important to prevent hypercoagulation.

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